Sonification of Multivariate Data

Jim Stevenson

Previously, a program called MULTIVAR was developed for sonification of multivariate data. Magnitude was represented by frequency. Rows or columns of the data matrix were sequentially displayed. MULTIVAR contained many switches for sorting or scaling data. Timing of presentation within and between rows of the data matrix was controllable by tables and switches.

Next, programs were developed to drive all the sound-generating registers of the OPL frequency modulator (FM) chip. Its driving tables contain control variables such as frequency, voice number, speaker channel, [volume, attack, decay, sustain, and release] for carrier and modulator, and many others including a percussion mode and a four-parameter mode. They also contain appropriate data variables. A C-header file called ssound.h was also developed to control the OPL chip. This made it possible to easily generate many sonification examples using mathematical functions, probability distributions, and multivariate high-order Markov chains.

In FY97 the OPL chip software was applied to MULTIVAR, making it possible for it to use volume and stereo panning as additional dimensions for data display. The polyphonic properties of the OPL chip enabled simultaneous display of several data elements as chords. Auditory illusions including Shepard tones were demonstrated.

Additional programs were written to produce simultaneous moving sources. Linear and Doppler ramps, starting and ending positions, frequencies, volumes, and their rates of change were driven by data tables.

Faster processors and sound-generating hardware have recently become available. This will make it possible to expand the repertoire of near real-time sonification tools far beyond the limits of the OPL chip.

Point of Contact: J. Stevenson
(650) 604-5720
jims@eos.arc.nasa.gov